1. What are the *possible Rational* roots of the polynomial below?

$$f(x) = 5x^2 + 3x + 6$$

   A. All combinations of: $\dfrac{\pm 1, \pm 5}{\pm 1, \pm 2, \pm 3, \pm 6}$

   B. $\pm 1, \pm 2, \pm 3, \pm 6$

   C. $\pm 1, \pm 5$

   D. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 3, \pm 6}{\pm 1, \pm 5}$

   E. There is no formula or theorem that tells us all possible Rational roots.

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2. What are the *possible Integer* roots of the polynomial below?

$$f(x) = 4x^3 + 5x^2 + 7x + 5$$

   A. All combinations of: $\dfrac{\pm 1, \pm 5}{\pm 1, \pm 2, \pm 4}$

   B. $\pm 1, \pm 5$

   C. $\pm 1, \pm 2, \pm 4$

   D. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 4}{\pm 1, \pm 5}$

   E. There is no formula or theorem that tells us all possible Integer roots.

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3. Factor the polynomial below completely, knowing that $x - 2$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 15x^4 - 71x^3 + 12x^2 + 116x + 48$$

   A. $z_1 \in [-5.2, -2.7]$, $z_2 \in [-2.28, -1.89]$, $z_3 \in [0.55, 0.73]$, and $z_4 \in [-0.06, 1]$

   B. $z_1 \in [-5.2, -2.7]$, $z_2 \in [-2.28, -1.89]$, $z_3 \in [1.36, 1.63]$, and $z_4 \in [1.29, 2.3]$

C. $z_1 \in [-5.2, -2.7]$, $z_2 \in [-2.28, -1.89]$, $z_3 \in [0.08, 0.3]$, and $z_4 \in [2.98, 3.64]$

D. $z_1 \in [-0.8, -0.3]$, $z_2 \in [-0.67, -0.27]$, $z_3 \in [1.8, 2.48]$, and $z_4 \in [3.99, 4.54]$

E. $z_1 \in [-2, -1]$, $z_2 \in [-1.72, -1.24]$, $z_3 \in [1.8, 2.48]$, and $z_4 \in [3.99, 4.54]$

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4. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{8x^3 - 24x^2 + 27}{x - 2}$$

A. $a \in [14, 18], b \in [8, 9], c \in [16, 17]$, and $r \in [58, 60]$.

B. $a \in [14, 18], b \in [-56, -55], c \in [109, 118]$, and $r \in [-197, -196]$.

C. $a \in [5, 10], b \in [-11, -2], c \in [-16, -11]$, and $r \in [-5, -4]$.

D. $a \in [5, 10], b \in [-17, -12], c \in [-16, -11]$, and $r \in [7, 17]$.

E. $a \in [5, 10], b \in [-43, -39], c \in [74, 87]$, and $r \in [-135, -130]$.

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5. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{16x^3 + 84x^2 - 97}{x + 5}$$

A. $a \in [16, 19], b \in [164, 167], c \in [820, 821]$, and $r \in [4001, 4004]$.

B. $a \in [16, 19], b \in [1, 6], c \in [-20, -18]$, and $r \in [-1, 4]$.

C. $a \in [-82, -76], b \in [-320, -311], c \in [-1583, -1577]$, and $r \in [-7999, -7993]$.

D. $a \in [-82, -76], b \in [482, 491], c \in [-2420, -2411]$, and $r \in [12002, 12004]$.

E. $a \in [16, 19], b \in [-12, -9], c \in [69, 77]$, and $r \in [-535, -527]$.

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6. Factor the polynomial below completely, knowing that $x-5$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 8x^4 - 30x^3 - 87x^2 + 155x + 150$$

A. $z_1 \in [-6.2, -4.4]$, $z_2 \in [-2.15, -1.97]$, $z_3 \in [0.56, 0.64]$, and $z_4 \in [2.55, 3.08]$

B. $z_1 \in [-1.8, -1.1]$, $z_2 \in [-0.43, -0.15]$, $z_3 \in [1.84, 2.03]$, and $z_4 \in [4.4, 5.57]$

C. $z_1 \in [-6.2, -4.4]$, $z_2 \in [-2.15, -1.97]$, $z_3 \in [0.34, 0.55]$, and $z_4 \in [0.91, 1.86]$

D. $z_1 \in [-6.2, -4.4]$, $z_2 \in [-2.15, -1.97]$, $z_3 \in [0.67, 0.99]$, and $z_4 \in [2.14, 2.86]$

E. $z_1 \in [-4, -2.2]$, $z_2 \in [-0.79, -0.71]$, $z_3 \in [1.84, 2.03]$, and $z_4 \in [4.4, 5.57]$

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7. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 20x^3 - 83x^2 - 95x + 50$$

A. $z_1 \in [-1.16, -0.26]$, $z_2 \in [2.38, 3.36]$, and $z_3 \in [4.32, 5.39]$

B. $z_1 \in [-5.24, -4.84]$, $z_2 \in [-2.8, -1.73]$, and $z_3 \in [0.34, 0.82]$

C. $z_1 \in [-5.24, -4.84]$, $z_2 \in [-0.35, -0.02]$, and $z_3 \in [4.32, 5.39]$

D. $z_1 \in [-5.24, -4.84]$, $z_2 \in [-1.03, -0.32]$, and $z_3 \in [1.09, 1.48]$

E. $z_1 \in [-1.45, -1.22]$, $z_2 \in [-0.07, 0.58]$, and $z_3 \in [4.32, 5.39]$

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8. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 20x^3 - 77x^2 + 89x - 30$$

A. $z_1 \in [0.74, 0.84]$, $z_2 \in [1.47, 1.68]$, and $z_3 \in [1.89, 2.27]$

B. $z_1 \in [0.49, 0.73]$, $z_2 \in [1.14, 1.3]$, and $z_3 \in [1.89, 2.27]$

C. $z_1 \in [-2.22, -1.99]$, $z_2 \in [-1.85, -1.62]$, and $z_3 \in [-0.9, -0.71]$

D. $z_1 \in [-2.22, -1.99]$, $z_2 \in [-1.28, -1.13]$, and $z_3 \in [-0.63, -0.44]$

E. $z_1 \in [-3.19, -2.76]$, $z_2 \in [-2.02, -1.87]$, and $z_3 \in [-0.35, -0.18]$

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9. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{6x^3 - 46x^2 + 88x - 43}{x - 5}$$

A. $a \in [1, 13]$, $b \in [-26, -19]$, $c \in [-4, 3]$, and $r \in [-43, -40]$.

B. $a \in [1, 13]$, $b \in [-77, -70]$, $c \in [465, 475]$, and $r \in [-2386, -2380]$.

C. $a \in [26, 32]$, $b \in [102, 112]$, $c \in [605, 610]$, and $r \in [2996, 3001]$.

D. $a \in [26, 32]$, $b \in [-198, -189]$, $c \in [1064, 1072]$, and $r \in [-5386, -5379]$.

E. $a \in [1, 13]$, $b \in [-19, -13]$, $c \in [8, 14]$, and $r \in [-7, 2]$.

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10. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{12x^3 - 64x^2 + 100x - 52}{x - 3}$$

A. $a \in [8, 17]$, $b \in [-28, -25]$, $c \in [14, 17]$, and $r \in [-4, 0]$.

B. $a \in [8, 17]$, $b \in [-100, -98]$, $c \in [400, 402]$, and $r \in [-1254, -1246]$.

C. $a \in [33, 45]$, $b \in [39, 48]$, $c \in [226, 233]$, and $r \in [642, 646]$.

D. $a \in [33, 45]$, $b \in [-175, -166]$, $c \in [616, 624]$, and $r \in [-1903, -1893]$.

E. $a \in [8, 17]$, $b \in [-44, -38]$, $c \in [19, 21]$, and $r \in [-19, -11]$.
